REMARKS

Claims 1, 2, 4 and 6 are presently pending in the application.

Claims 3 and 5 have been canceled and their subject matter incorporated into claim 1. Claim 4 has been amended to correct the dependency. No new matter has been added by these amendments.

CLAIM REJECTIONS

In Paper No. 04202004, the Examiner has rejected claims 1, 2, and 6 under 35 U.S.C. § 103(a) as being unpatentable over JP 11-288705-A of Koji ("JP '705"). The Examiner has also rejected claims 3 – 5 under 35 U.S.C. § 103(a) as being unpatentable over JP '705 in view of JP 09-235111-A of Naoki et al. ("JP '111"). Applicants respectfully traverse these rejections and the arguments in support thereof as follows, and respectfully request reconsideration and withdrawal of the rejections.

Rejection of Claims 1, 2, and 6 Under 103(a) Based on JP '705

Regarding claims 1, 2, and 6, the Examiner argues that JP '705 discloses a negative electrode comprising: carbon material having irreversible capacity during the initial charge and discharge and $Li_{3-X}M_XN$, wherein M is at least one selected from the group consisting of Co, Ni, Mn and Cu and $0.2 \leq x \leq 0.8$. The Examiner admits that, unlike claim 1 of the present application, JP '705 does not teach a ratio of 100 parts by weight of carbon to 20 – 150 parts by weight of lithium-containing complex nitride, but rather a ratio of carbon to lithium-containing complex nitride of 87:5. JP '705 allegedly discloses that mixing the carbon and lithium-containing complex nitride can control the irreversible capacity. The Examiner further argues that the negative electrode in JP '705 has a discharge capacity which is the same improved capacity as Applicants' electrode. The Examiner concludes that the difference between the ratios of carbon to lithium-containing complex nitride in Applicant's electrode and the electrode in JP

'705 are not held to be critical differences since both ranges achieve the same capacity characteristics, and further that it would have been obvious at the time the claimed invention was made to modify the teachings of JP '705 by varying the ratio of carbon to lithium–containing complex nitride to any number provided that the mixture improves capacity. Applicants respectfully disagree.

First, JP '705 does not teach or suggest that lithium-containing complex nitride can control the irreversible capacity of amorphous carbon or low crystalline carbon, but rather suggests that lithium-containing complex nitride can control the irreversible capacity of an electrode that is made of graphite. There is no suggestion in JP '705 that the carbon material may be amorphous carbon or low crystalline carbon as claimed, which is acknowledged by the Examiner.

While an advantage of using amorphous carbon and low crystalline carbon is its high theoretical capacity, these materials also have large irreversible capacity. Applicants have overcome this irreversible capacity without increasing the size of the electrode by using lithium ions in a lithium-containing complex nitride as an auxiliary negative electrode material. (See page 7, lines 16 – 24). The negative electrode of the present invention thus contains the nitride as a main component, mixed with amorphous or low crystalline carbon. This electrode exhibits a dramatic decrease in irreversible capacity (increase in discharge capacity) without increasing the weight of the negative electrode. JP '705 does not suggest compensation of the irreversible capacity of the carbon materials by a lithium-containing complex nitride. As explained in more detail below, the negative electrode of the present invention contains 20 to 150 parts by weight of lithium-containing complex nitride per 100 parts by weight of the carbon material, such that the nitride is a major component. In contrast, JP '705 teach that the negative electrode contains only 5.75 parts by weight of lithium containing-complex nitride per 100 parts by weight of graphite. Due to the differences in irreversible capacity between graphite and amorphous or low crystalline carbon, it would not have been obvious to modify JP '705 to utilize the claimed amorphous or low crystalline carbon, nor would such a modification be expected to be effective.

Applicants disagree with the Examiner's contention that the difference in ranges of the electrode material is not critical because both ranges achieve the same capacity characteristics. Despite the Examiner's assertion to the contrary, Applicants' electrode exhibits a much higher density capacity than the electrode disclosed in JP '705. Specifically in one example, a series of electrodes according to the claimed invention contained 0.12 g of a mixture of amorphous carbon and nitride (see page 22, lines 15 – 21 of the present application). As shown in Table 1 at page 23, the minimum discharge exhibited by an electrode containing 20 parts of $Li_{2.6}Co_{0.4}N$ per 100 parts by weight of amorphous carbon was 53 mAh, resulting in a capacity density of 442 mAh/g (53 mAh / 0.12 g). In contrast, the electrode disclosed in JP '705 consisted of 0.23 g of graphite and nitride (surface area of 25 cm^2 * 0.01 g/cm^2 * 0.92 of total electrode weight) and produced a discharge capacity of 57 mAh. This electrode thus exhibits a capacity density of only 248 mAh (57 mAh / 0.23 g). Thus, if Applicants' electrode and the electrode in JP '705 were of equal weight, Applicants' electrode would yield approximately twice as much discharge capacity. The improved discharge capacity of Applicants' electrode is due to the inherent differences between Applicants' electrode and that of JP '705, namely, the use of lithium-containing complex nitride as a major component in combination with amorphous or low crystalline carbon.

In conclusion, the Examiner has failed to support his rejection of claims 1, 2, and 6 and reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a) are respectfully requested.

Rejection of Claims 3 – 5 Under 103(a) Based on JP '705 in view of JP '111

The Examiner admits that JP '705 does not disclose the carbon material being a low crystalline carbon, in fibrous form having a mean fiber diameter of 1 – 50 microns and mean fiber length of 10 – 200 microns, or being amorphous carbon. However, the Examiner argues that JP '111 discloses providing low crystalline carbon as a negative electrode material wherein the carbon is in fibrous form having a mean fiber diameter of 1 – 20 microns and a mean fiber length of 100, 50, or 30 microns, and that the carbon is amorphous. The Examiner also contends

that the motivation for using the carbon material in JP '111 in a negative electrode is that it improves the charge and discharge capacity of the negative electrode. The Examiner thus concludes that it would have been obvious at the time the claimed invention was made to modify the teachings of JP '705 by using the carbon material of JP '111 in a negative electrode. Applicants respectfully disagree.

As previously explained, the technique disclosed in JP '705 is not applicable to an electrode containing amorphous carbon and/or low crystalline carbon. JP '705 discloses an electrode in which lithium-containing complex nitride is an additive to graphite. While this technique is effective when using a carbon material with small irreversible capacity, such as graphite, it would not be similarly effective with carbon materials having high irreversible capacity, such as amorphous and low crystalline carbon, as taught by JP '111. Therefore, there would be no reasonable expectation of success in the proposed combination of JP '705 and JP '111, and it would not have been obvious at the time the claimed invention was made to modify the teachings of JP '705 by using the carbon material of JP '111 in a negative electrode. No *prima facie* case of obviousness has been established by the examiner based on the proposed combination.

Finally, even if the proposed combination of references were valid, Applicants' invention exhibits results which would be unexpected. Specifically, even the proposed combination of JP '705 and JP' 111 would not suggest that an electrode exhibiting a higher discharge capacity without an increase in overall size would be realized by incorporating lithium-containing complex nitride as an auxiliary negative electrode material with amorphous carbon and/or low crystalline carbon. As previously explained, if Applicants' electrode and the electrode in JP '705 were of equal weight, Applicants' electrode would yield approximately twice as much discharge capacity due to the large difference in capacity density between amorphous and/or low crystalline carbon and graphite. Such unexpected results would overcome any *prima facie* case of obviousness. Accordingly, reconsideration and withdrawal of the § 103(a) rejections are respectfully requested.

In view of the preceding Amendments and Remarks, Applicants respectfully request that the pending claims are patentably distinct over the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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(Date)

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